CYTOLOGICAL STUDIES OF FIVE SPECIES OF DRAGONFLIES (ONDONATA: ANISOPTERA)[1]

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Although the taxonomy and biology of North American dragonflies have been thoroughly studied by many authors, their cytology, in comparison with that of Old World species, has long been neglected. Cumming (1964) and Cruden (1968) reported on the cytogenetics of New World Odonata and to these extensive data I should like to add chromosomal descriptions of five species either not covered by these authors or reported at different chromosome numbers.

Nymphal testes were used for this investigation. They were dissected in normal saline and permanent slides were made following the technique described previously (Hung, 1969) except without colchicine treatment. Nymphs from which the testes were removed were preserved for my personal collection and are available upon request. The identification of the species was based on Needham and Westfall (1955).

Aeschna clepsydra Say

July 13, 1968. English Coulee, University of North Dakota Campus, Grand Forks, N. D. (acc. nos. 68-50-1, 68-50-3).

Of the 44 cells studied, 36 showed 14 elements (including the m-chromosomes) at diakinesis. In some cases, the single X chromosome has already divided into two chromatids and formed a ring before the first meiotic division (which is equational in Odonata), thus it cannot

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be distinguished from other bivalents (Fig. 1). However, in metaphase II, the X chromosome can be recognized in both polar and equatorial views (Fig. 2).

Aeschna verticalis Hagen

May 30, 1968. Turtle River across US Highway # 2, about 0.4 mile west of Turtle River Park entrance, Grand Forks Co., N. D. (acc. no. 68-43).

Not many cells can be studied in the slides prepared. From the 5 cells studied, it seems to show 14 elements at diakinesis with a barely recognizable pair of m-chromosomes and the X cannot be distinguished (Fig. 3).

Epicordulia princeps Hagen

May 18, 1968. Lake Itasca, Minn. Along the shore near the student cabins of the Forestry and Biological Station of the University of Minnesota (acc. no. 68-34-3).

11 ordinary bivalents, one pair of terminally associated m-chromosomes and one univalent X were found in all the 13 cells studied (Fig. 4).

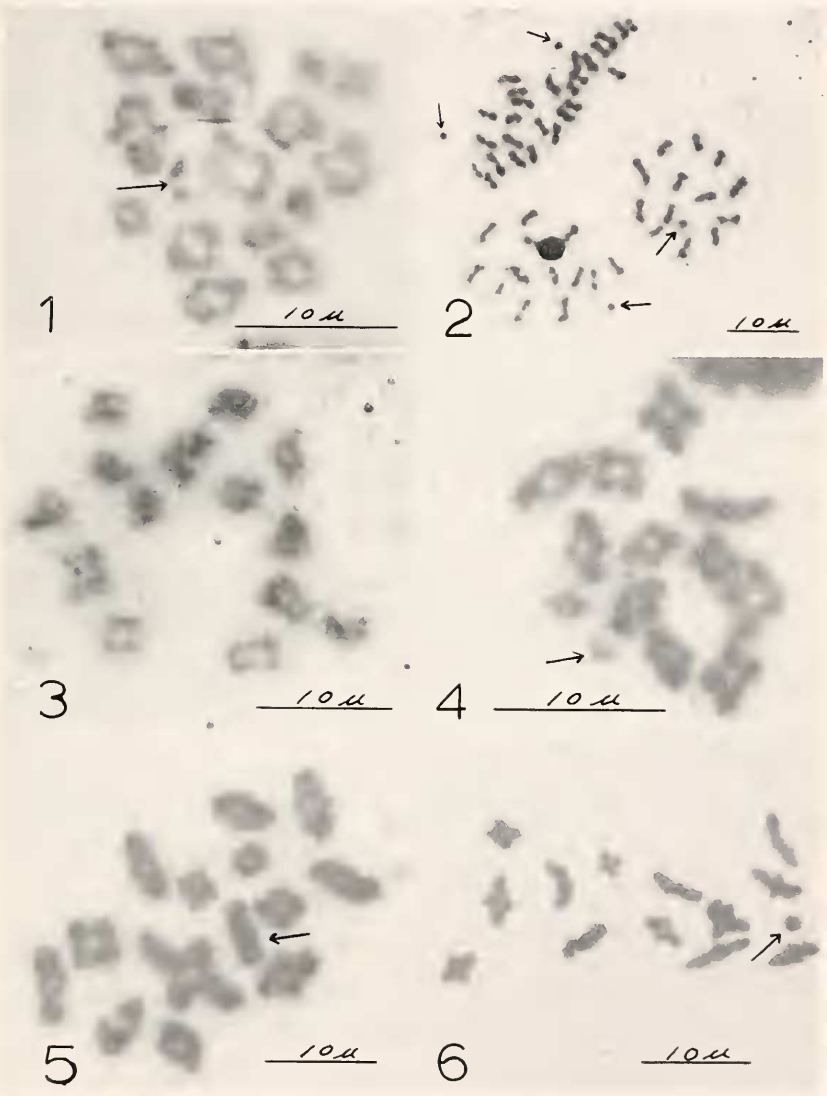
Tetragoneuria spinigera Selys

Found with *E. princeps* at the same locality (acc. no. 68-34-1). Among the 150 nymphs collected there are 148 nymphs of *T. spinigera* and only 2 of *E. princeps.*

The species displayed 14 elements at diakinesis. There seems to be no m-chromosomes in this species since all chromosomes, except the univalent X, have chiasmata (Fig. 5). Another species in this genus, *T. petechialis* from Texas, has n = 11 and lacks m-chromosomes (Cumming, 1964).

Erythrodiplax berenice Drury

Date and locality are the same as *A. clepsydra* (acc. no. 68-50-2). Cumming (1964) reported n = 11-13 for several species in this genus. According to Cruden (1968) this species has n = 13 and lacks m-chromosomes. However, among the 12 cells studied in this investigation, only one cell has 13 elements (without univalent X) at diakinesis.



FIGURES 1-6. Fig. 1. *Aeschna clepsydra,* diakinesis. Note the terminally associated m-chromosomes (arrow). Fig. 2. *A. clepsydra,* metaphase II with X chromosomes (arrows). Fig. 3. *A. verticalis,* diakinesis. Fig. 4. *Epicordulia princeps,* diakinesis with m-chromosomes (arrow) and univalent X chromosome. Fig. 5. *Tetragoneuria spinigera,* diakinesis (the X chromosome is arrowed). Fig. 6. *Erythrodiplax berenice,* diakinesis (the arrow indicates m-chromosomes).

All other cells show 14 elements including X and m-chromosomes (Fig. 6); hence it seems that n = 14 for this species.

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2.0092. Cytological studies of five species of dragonflies (Odonata: Anisoptera).

Abstract.—Chromosomes of the following 5 species of dragonflies from Minnesota and North Dakota are reported: *Aeschna clepsydra,* n=14 with m-chromosomes; *Aeschna verticalis,* n=14 including m-chromosomes; *Epicordulia princeps,* n=13 including m-chromosomes; *Tetragoneuria spinigera,* n=14 and without m-chromosomes; *Erythrodiplax berenice,* n=14 with m-chromosomes.—A. Chang-Fu Hung, *Department of Biology, University of North Dakota, Grand Forks, ND 58201.*

Descriptors: Odonata; Anisoptera; Chromosomes; *Aeschna clepsydra; Aeschna verticalis; Epicordulia princeps; Tetragoneuria spinigera; Erythrodiplax berenice.*